WinFrog Device Group:	USBL
Device Name/Model:	LXT 4430A
Device Manufacturer:	**ORE Offshore Division** 10450 Stancliff, Suite 115. Houston, Texas 77099 Tel (281) 879-7277, Fax (281) 879-9213
Device Data String(s) Output to WinFrog:	"Target\tAge\tX\tY\tZ\t "
WinFrog Data String(s) Output to Device:	Nil
WinFrog .raw Data Record Type(s):	Type 309 (USBL)

DEVICE DESCRIPTION:
The ORE LXT System is modelled after the Trackpoint II, with simplified functions, keeping cost and complexity at a minimum. The system is ideal for tracking of underwater targets, from small open vessels and can be operated using AC or DC power sources. The basic LTX system consists of:

- Model 4430A Command/Display Module
- Model 4213A Transducer Assembly
- Model 4113A Interconnect Cable
- Model 4430A Acoustic Transponder
- Model 4334A Battery Charger.

LXT System

DEVICE CONFIGURATION INSTRUCTIONS:
Baud Rate: 9600
Data Bits: 8
Stop Bits: 1
Parity : None

Standard RS-232C serial communication used to output data to Winfrog.

WINFROG I/O DEVICES > CONFIG OPTIONS:
The LXT is accessed via the USBL device types. The Hydrophone and Beacon sub-devices are added to the computer when the LXT 4430A is added. No configuration is available from the I/O Devices Window.

WINFROG VEHICLE TEXT WINDOW > CONFIGURE VEHICLE DEVICES > DEVICE > EDIT OPTIONS:
As mentioned above, adding the LXT 4430A device to WinFrog creates two separate data items: the USBL, LXT 4430A, USBL HYDROPHONE and the USBL, LXT 4430A, BEACON.

For remote vehicle tracking, the Hydrophone data item must be added to the device list of the vehicle to which the hydrophone has been physically attached (i.e. the main ship). The Beacon data item must be added to the vehicle to which the beacon has been physically attached (i.e. the ROV or towed vehicle).

USBL systems can also be used for positioning of the main vessel. In this type of operation the USBL Beacon must be physically attached to some fixed point on the seabed or subsurface structure. In this type of operation the Hydrophone position (i.e. vehicle position) is derived from measurements made to the fixed beacon. For this type of positioning, you must define a working Xponder File (*.XPT) in WinFrog, and enter the fixed position of the Beacon into that file. The Hydrophone must be added to the ship's device list and configured for positioning as opposed to tracking mode. See chapter 5 of the WinFrog Users Guide for more information on setting up *.XPT files.

1. Configuration of the USBL Hydrophone.
Once the LXT 4430A Hydrophone has been added to the appropriate vehicle's device list it must be edited to suit the application. In the vehicle's Devices list, highlight the USBL, LXT 4430A, USBL HYDROPHONE then click the Edit button. The Configure USBL Hydrophone dialog window appears as seen below.
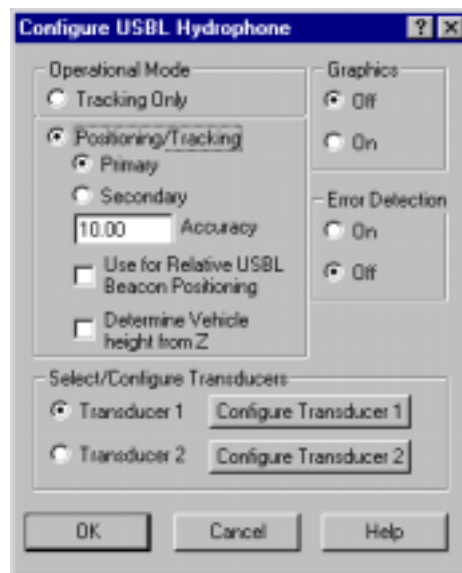
Operational Mode:
As mentioned above, USBL systems can be used for tracking of remote vehicles or for positioning of the main vehicle to which the hydrophone is attached. Select **Tracking Only** if relative tracking of a structure/vessel is desired.

Select **Positioning/Tracking** and **Primary** if you want to position the Master Vessel relative to a stationary (fixed) beacon. The beacon must be located on the stationary (fixed) object, as defined in a working XPONDER (.XPT) file. Select the **Secondary** radio button if this is not the primary positioning source (i.e. if this is a comparison position), or if you are setting up for a USBL Calibration. Note as well that if you are setting up for a USBL Calibration, the Hydrophone should also be specified as a Secondary positioning device. See chapter 20 of the WinFrog Users Guide for more information on USBL Calibrations.

If **Positioning/Tracking** is selected, you can also specify **Use for Relative USBL Beacon Positioning.** This feature controls the use of the USBL positioning of the hydrophone from a fixed beacon for application to relative USBL Beacon positioning. In this mode, the difference between the hydrophone position as determined directly from observation to fixed beacon is compared to the hydrophone position determined from other positioning sources (e.g. DGPS). This difference is then applied to the position determined for any tracked beacon. The concept is that any inherent errors due to local conditions, both environmental and mechanical, are cancelled out. This is independent of the Primary/Secondary setting.

Note: the default value for the Positioning Accuracy is 10m. It is not recommended to set this value below 7m. In Tracking Mode, the accuracy setting is in the Beacon configuration dialog.

Determine Vehicle height from Z
Select this checkbox if the USBL system is to be used to determine the height of the vehicle. This is independent of the Primary/Secondary setting.

Graphics:
Selecting the On radio button will display the device name and a square at the location of the hydrophone, within the Graphics and Bird's Eye windows.

Error Detection:
By enabling this option, error detection codes are printed in the Raw Files. This option is mainly for post analysis and future development.

Select/Configure Transducers:
Two Hydrophone locations can be configured for use. Click Configure Transducer 1 or Configure Transducer 2 as required. The Configure USBL Transducer dialog box appears as seen below.
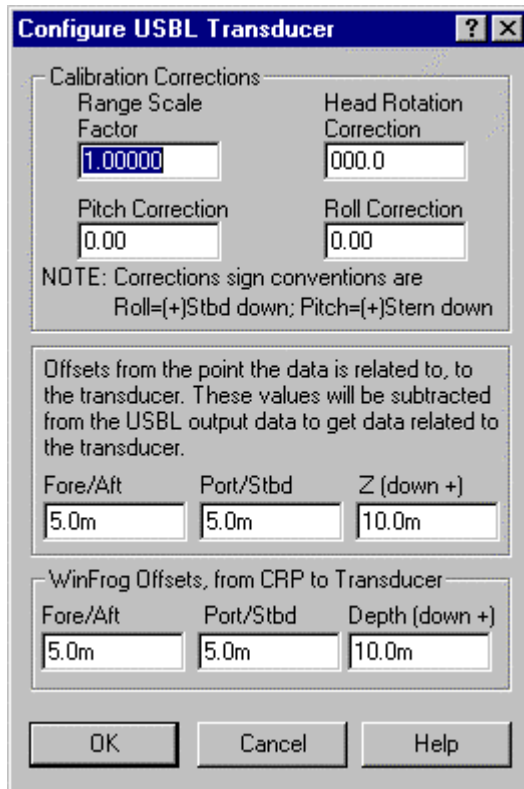
Calibration Corrections:
WinFrog allows you to enter Range Scale, Heading, Pitch and Roll correction values to correct raw USBL measurements. Note that the Heading, Pitch and Roll values are entered in degrees and decimal degrees. These values can be determined by using WinFrog's USBL calibration utility. See chapter 20 of the WinFrog User's Guide for detailed information on calibration of USBL systems.

Offsets:
In order that the USBL XYZ data from the LXT 4430A is correctly referenced, you may be able to enter offsets in the Control Unit to reference the output to the vessels' Centre of Gravity (COG).

The upper fields are used to remove any offsets that have been entered into the LXT 4430A console. This may come into use specifically when USBL systems are used for vessel positioning, where the ship's DP system needs positional information to relate to the vessel's center of gravity as opposed to just at the USBL hydrophone. WinFrog however requires all XYZ offsets to relate to the USBL hydrophone. These upper fields are then used to enter the same offsets as are entered in the LXT 4430A Console, nullifying the offsets in the LXT 4430A. As these values are subtracted from the received data, ensure that values are entered using the same sign as internal LXT 4430A offsets.

The lower fields, **Winfrog Offsets, from CRP to Transducer**, are similar to all other positional device offsets entered in Winfrog. These offsets must be entered to relate

the hydrophone's position to the vessel's Common Reference Point (CRP). All offsets are entered with signage referring to the distance *from* the CRP *to* the hydrophone. For the example below, the LXT 4430A is located 5 (m) aft, 5 (m) starboard and 10 (m) below the CRP.
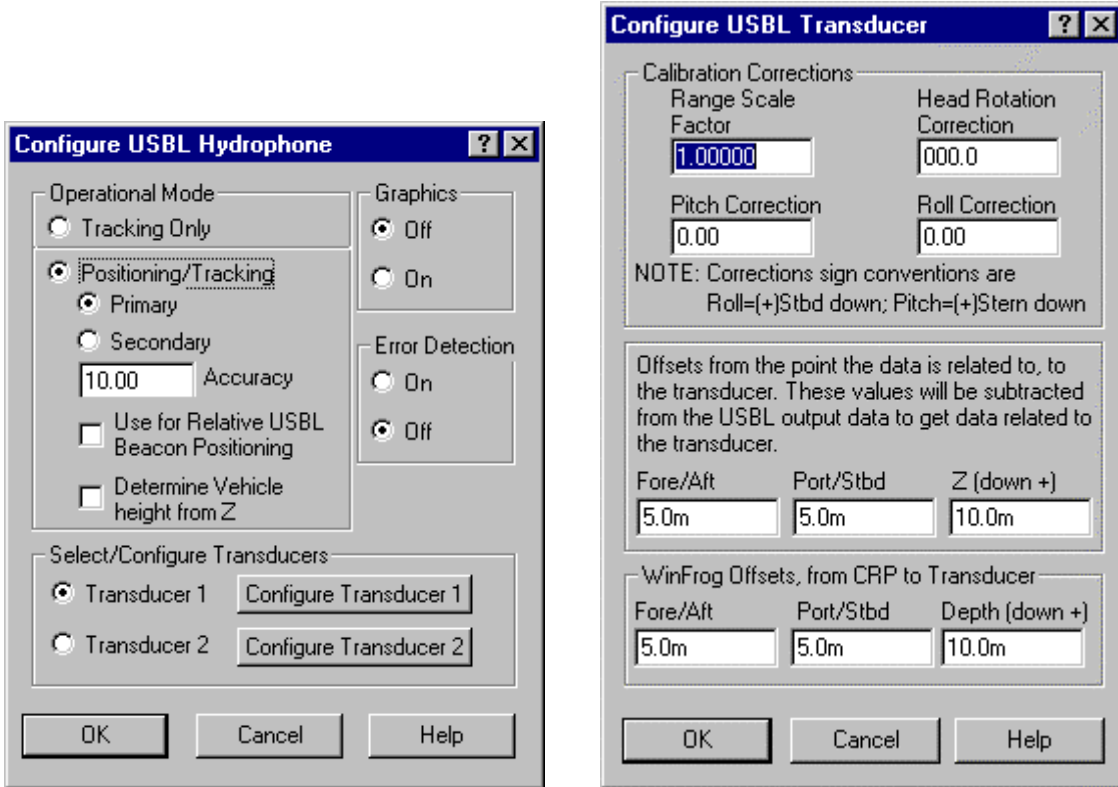
2. Configuration of the USBL Beacon.

As mentioned above, for subsurface vehicle positioning, the USBL beacon must be added to the appropriate vehicle's device list. Once added to the device list, it must be edited to suit the application. Editing the USB, ATS, Beacon device brings up the Configure USBL Beacon dialog window, as seen below.
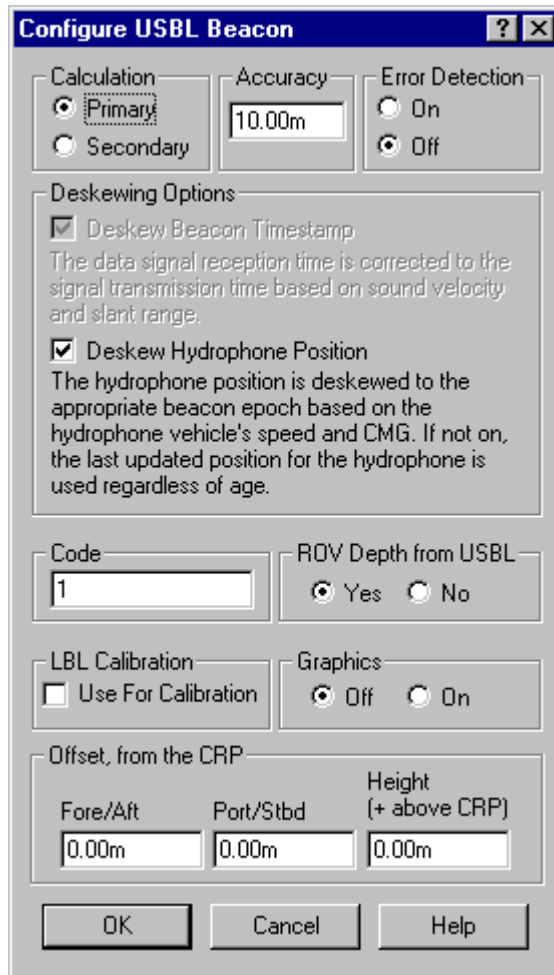
Calculation
Set Calculation to **Primary** if the beacon is to be used for positioning the vehicle to which it is attached. Multiple beacons can be added to the same vehicle's device list, each configured as Primary. WinFrog will calculate a weighted mean position using the Accuracy value entered.

Accuracy
This value is used by WinFrog to weight the use of different positioning devices in solving a single vehicle's position. The lower the accuracy value entered, the more accurate it is deemed to be, and hence the more weight that will be applied to it in comparison to the other devices.

Error Detection:
Setting Error Detection to 'On' instructs WinFrog to identify error codes received in the USBL data string and disable the use of bad data. USBL systems include various error codes in the data string when the beacon is not within the optimum "cone of operation" or other operational parameters have been exceeded.

Deskewing Options

Deskew Beacon Timestamp
This option is for future development.

Deskew Hydrophone Position
When positioning the beacon, WinFrog uses the last calculated position for the associated USBL Hydrophone to determine the tracked beacon's position. Depending on the vehicle's Kalman filter and Dead Reckoning settings, the position of the hydrophone may be up to 1 second old.
It is recommended that this deskewing option be enabled to remove positional inaccuracies associated with this latency.

Code:
Enter a value matching the code of the beacon attached to the vehicle.

ROV Depth from USBL:
If **Yes** is selected, the ROV's depth will be set to the calculated USBL beacon depth.

LBL Calibration:
This can be set to 'on' if the Beacon is to be used in an LBL Calibration.

Graphics:
By setting the Graphics to On, a square and label will be displayed for the Beacon location in the Graphics and Bird's Eye displays.

Offsets:
This portion of the dialog box is used to enter Offsets that relate the beacon's location to the vehicle's Common Reference Point (CRP). These values are set similar to values that would be applied to any device offset within Winfrog, with values entered as measured from the CRP to the device. A heading device must also be added to the vehicle's device list to ensure the correct application of the offsets.

CONFIGURATION DETAILS:
The LXT 4430A is similar to the Trackpoint II system, with simplified functions to keep cost and complexity to a minimum. The unit is portable and rugged and is designed to operate in open vessels in various weather conditions. The system will operate on AC or 20 to 60VDc.